

PPOL 602 - Social Network Analysis

Syllabus – Subject to Change – Last Updated: 1/13/2023

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Course Description:

Social network analysis is primarily concerned with quantitatively summarizing the connections that exist between different social entities (usually people, but sometime organizations, nations, families, etc.), and measuring how individuals are shaped by those connections. In this class, you will receive an introduction to different ways of analyzing social networks, and the questions, puzzles, and theories that are of interest to social network analysts. You will also begin to develop the core technical skills necessary for network analysis, by building network datasets, modeling network phenomena, and creating network visualizations.

Weekly Schedule:

Lectures: Tuesday, 6:30-9pm; Intercultural Center 116

Office Hours: Online, by appointment. On most class nights I will plan to stick around class afterwards to answer further questions.

Learning Objectives:

By the end of this course, you should:

1. Know basic network vocabulary and metrics.
2. Be able to collect and structure data that is suitable for network analysis.
3. Understand the mechanisms that guide the formation of social networks, and to be familiar with different ways of modeling and summarizing the structure of networks.
4. Have a sense for the social processes that social networks facilitate, and be familiar with different ways of modeling network influence and diffusion processes.
5. Feel comfortable critically evaluating research that draws on network analysis methods.
6. Know how the networks perspective can help us better understand broader social phenomena.

Prerequisites:

If you are unfamiliar with quantitative data analysis and programming, you should be prepared to work harder to pick these things up. Familiarity with basic concepts in probability, statistics, discrete math, and linear algebra will be helpful, but are by no means required.

Computational components of the course will use the R coding language. I will use RStudio as an environment for R and recommend that you do the same. (We also may do some exercises in NetLogo, a program used for creating and visualizing social simulations, but these will not require coding.)

Materials:

The course textbook is *Analyzing Social Networks Using R*, by Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson, and Filip Agneessens. It is available on Amazon both digitally and in print.

Some readings will come from *Networks, Crowds, and Markets*, which is available in its entirety online: <https://www.cs.cornell.edu/home/kleinber/networks-book/>

Other articles will be posted on Canvas. Readings are suggested and meant to help guide you through the concepts and ideas we discuss in class, and give interested students the chance to explore certain topic areas in greater depth.

Class Sessions:

These will be a combination of lectures, discussions, and in-class activities. Please bring your computer to participate in class exercises – these will help you get more ‘hands on’ experience with network analysis, and will often mirror questions from problem sets.

Grading and Assessment:

The course grading will consist of problem sets, a single midterm examination, an independent network analysis project, and participation.

Problem Sets: 45%

There will be 5 assignments over the course of the semester. They will be assigned 2 weeks from the time they are due. Most will involve a combination of data analysis, coding, quantitative reasoning, and thinking critically about network problems and data. Canvas will be used for all submitted work.

Midterm Assessment: 15%

There will be one in-class assessment of your understanding of the basics of network notation/concepts and reasoning with network data and problems.

Participation/Attendance: 10%

I am looking for evidence that you are engaging with the class – this means showing up and contributing on a regular basis.

Independent Network Analysis: 30%

You will build a small dataset on a topic of your own choosing, construct a network(s), perform analysis and visualization of your choice, and briefly present your findings to the class. I will ask for you to submit your topic and data earlier in the semester to make sure you are on the right track. During the final class session you will present your data and preliminary findings to the class.

Late Work

I understand that this class is not the only priority in your life and will try to be as flexible as possible. That said, deadlines are important in terms of keeping pace with the material, and in protecting both your time and mine. It is important that you are *extremely* proactive about communicating with me if you are having trouble with completing assignments on time. In the absence of an acceptable excuse or instructor permission, I will penalize work late work by 10%

after the first day, 15% after three days, 20% after a week, and an additional 20% for each additional week thereafter.

Grade Distributions:

I may lower these thresholds as the semester goes on (I will not raise any number below), but at a minimum the following numerical averages will correspond to the following grades:

Grade	Range
A	94% or Higher
A-	90% - 93.99%
B+	87% - 89.99%
B	83% - 86.99%
B-	80% - 82.99%
C	70% - 79.99%
F	Less than 70%

Academic Resource Center/Disability Support: If you believe you have a disability, contact the Academic Resource Center (arc@georgetown.edu) for further information. The Center is located in the Leavey Center, Suite 335 (202-687-8354). The Academic Resource Center is the campus office responsible for reviewing documentation provided by students with disabilities and for determining reasonable accommodations in accordance with the Americans with Disabilities Act (ASA) and University policies. For more information, go to <http://academicsupport.georgetown.edu/disability/>.

Important Academic Policies and Academic Integrity: McCourt School students are expected to uphold the academic policies set forth by Georgetown University and the Graduate School of Arts and Sciences. Students should therefore familiarize themselves with all the rules, regulations, and procedures relevant to their pursuit of a Graduate School degree. The policies are located at: <http://grad.georgetown.edu/academics/policies/>

Collaboration and Integrity

For this class specifically, while you are encouraged to consult with one another and help one another, you should each be completing the assignments on your own. This means that while you can discuss an assignment with your peers, you should not be sharing snippets of code or written answers to questions. If an assignment involves building a dataset, you should not be submitting the same data as someone else. **If you are consulting with someone, please list their names on your assignment.**

Provost's Policy Accommodating Students' Religious Observances:

Georgetown University promotes respect for all religions. Any student who is unable to attend classes or to participate in any examination, presentation, or assignment on a given day because of the observance of a major religious holiday or related travel shall be excused and provided with the opportunity to make up, without unreasonable burden, any work that has been missed

for this reason and shall not in any other way be penalized for the absence or rescheduled work. Students will remain responsible for all assigned work. Students should notify professors in writing at the beginning of the semester of religious observances that conflict with their classes. The Office of the Provost, in consultation with Campus Ministry and the Registrar, will publish, before classes begin for a given term, a list of major religious holidays likely to affect Georgetown students. The Provost and the Main Campus Executive Faculty encourage faculty to accommodate students whose bona fide religious observances in other ways impede normal participation in a course. Students who cannot be accommodated should discuss the matter with an advising dean.

Title IX/Sexual Misconduct

Georgetown University and its faculty are committed to supporting survivors and those impacted by sexual misconduct, which includes sexual assault, sexual harassment, relationship violence, and stalking. Georgetown requires faculty members, unless otherwise designated as confidential, to report all disclosures of sexual misconduct to the University Title IX Coordinator or a Deputy Title IX Coordinator. If you disclose an incident of sexual misconduct to a professor in or outside of the classroom (with the exception of disclosures in papers), that faculty member must report the incident to the Title IX Coordinator, or Deputy Title IX Coordinator. The coordinator will, in turn, reach out to the student to provide support, resources, and the option to meet. [Please note that the student is not required to meet with the Title IX coordinator.]. More information about reporting options and resources can be found on the Sexual Misconduct Website: <https://sexualassault.georgetown.edu/resourcecenter>.

If you would prefer to speak to someone confidentially, Georgetown has a number of fully confidential professional resources that can provide support and assistance. These resources include:

Health Education Services for Sexual Assault Response and Prevention: confidential email sarp@georgetown.edu

Counseling and Psychiatric Services (CAPS): 202.687.6985 or after hours, call (833) 960-3006 to reach Fonemed, a telehealth service; individuals may ask for the on-call CAPS clinician

More information about reporting options and resources can be found on the [Sexual Misconduct Website](#).

Tentative Schedule and Topics (As of 1/13/2023)

Part I: Introduction to Networks, Measures and Metrics, and Network Position

1/17: Course Overview/Intro to Network Models and Measures

Suggested Readings:

Excerpt from *Connected* (Christakis and Fowler)

1/24: Models and Measures Continued, In-class Network-building

Problem Set 1 Assigned

Suggested Readings:

Borgatti et. al Chapter 1 (Introduction)

Borgatti et. al Chapter 2 (Mathematical Foundations)

1/31: Ego Networks and Centrality, Social Capital

Suggested Readings:

Marsden 1987 - Core Discussion Networks

Borgatti 2005 - Centrality and Network Flow

Borgatti et. al Chapter 15 (Ego Networks)

Borgatti et. al Chapter 10 (Centrality)

Part II: Determinants and Models of Network Structure

2/7: Mechanisms of Tie Formation and Homophily:

Problem Set 1 Due

Problem Set 2 Assigned

Suggested Readings:

Rivera et al 2010

McPherson et al 2001

2/14: Triangles and Exponential Random Graph Models

Suggested Readings:

Borgatti et. al Chapter 15 (Only Parts on ERGMs)

Goodreau et 2009 (Focus on part through p. 108).

2/28: Focal Theory of Networks, Communities/Equivalence/Cohesion

Problem Set 2 Due

Problem Set 3 Assigned

Suggested Readings:

Feld 1981 – The Focused Organization of Social Ties
Borgatti et. al Chapter 11 (Subgroups)
Borgatti et. al Chapter 12 (Structural Equivalence)
Borgatti and Grosser 2015 (Structural Equivalence – Meaning and Measures)
Optional: Borgatti et. al Chapter 6 (Only Read Part on Hierarchical Clustering)
Optional: Fredkin 1984 Structural Equivalence and Cohesion
Optional: Fortunato 2010 (Parts 1-6)

3/14: Random Walks on Networks and Network Sampling

Suggested Readings:

Heckathorn and Jeffri 2001

Part III: Advanced Network Structure

3/21: Preferential Attachment and Core-Periphery Networks; Multiplex/Weighted/Signed Networks

Problem Set 3 Due

Midterm Review Distributed

Suggested Readings:

Travers and Milgram 1969
Watts and Strogatz 1998
Watts 1999 (Skim)
Barabasi and Bonabeau 2003
Barabasi and Albert 1999
Borgatti et. al - Ch. 14.5 - Optional

3/28: *Midterm Assessment*

4/4: Bipartite Networks and Projections, QAP Models

Problem Set 4 Assigned

Suggested Readings:

Borgatti et. al Chapter 8 (through 8.5)
Krackhardt 1987 (through p. 179)
Barthelemy et. al 2005
Brieger 1974

Part IV: Network Processes: Influence, Contagion, and Polarization

4/11: Models of Contagion, Diffusion, and Influence

Final Project Introduced

Suggested Readings:

Easley & Kleinberg – Chapter 19 & 21
Valente 1996
Centola 2010

4/18: Stochastic Actor Oriented Models, Models of Network Polarization

Problem Set 4 Due

Project Proposal Due

Problem Set 5 Assigned

Suggested Readings:

Kossinets and Watts 2006
Snijders et. al 2010
Mercken et. al 2010
Della Posta et. al 2015

Part V: Visualization and Presentations

4/25: Data Visualization; In-class Workshop on Final Presentations

(Initial) Project Data Due

5/2: In class-presentation

Problem Set 5 Due

Final Project Presentations (Due)

5/11 (Thursday): Final Papers/Projects due to Canvas by 11:59pm